Online Appendix for
"Stock Return Autocorrelations and Expected Option Returns"

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This document supplements the paper "Stock Return Autocorrelations and Expected Option Returns." It provides additional results and robustness analyses which are not displayed in the published text.

OA.1 Proof of Proposition 1

Consider a general European derivative with maturity $t+\tau$ and a payoff at maturity given by

$$H_{t+\tau} = h(S_{t+\tau}), \tag{1}$$

where $h(S_{t+\tau})$ is a deterministic function of the underlying stock price at $t+\tau$. As noted in Grundy (1991) and Lo and Wang (1995), the drift of the stock price process is irrelevant for determining the price of the derivative today, and we can use the risk-neutralized process of the stock price to determine the price of the European derivative today. Under the risk neutral measure, the continuously compounded return of $r_{t+\tau} = \log(S_{t+\tau}) - \log(S_t)$ is normally distributed with a mean of $\tau\left(r - \frac{\sigma^2}{2}\right)$ and variance of $\tau\sigma^2$. It follows that the current price of the European derivative is given by

$$\begin{aligned} H_t(S_t, \sigma) &= e^{-r\tau} E_t^{\mathbb{Q}}[h(S_{t+\tau})] \\ &= e^{-r\tau} \int_{-\infty}^{\infty} h\left(S_t e^{(r-\frac{1}{2}\sigma^2)\tau + \sigma\sqrt{\tau}v}\right) \phi(v)\mathrm{d}v. \end{aligned} \tag{2}$$

Similarly, the price of the derivative at time $t+k$, where $0 \le k \le \tau$, can be obtained as

$$\begin{aligned} H_{t+k}(S_{t+k}, \sigma) &= e^{-r(\tau-k)} E_{t+k}^{\mathbb{Q}}[h(S_{t+\tau})] \\ &= e^{-r(\tau-k)} \int_{-\infty}^{\infty} h(S_{t+k} e^{(r-\frac{1}{2}\sigma^2)(\tau-k) + \sigma\sqrt{\tau-k}v})\phi(v)\mathrm{d}v. \end{aligned} \tag{3}$$

Under the physical measure, the stock price follows a trending O-U process and its k-period continuously compounded return $r_k = \log(S_{t+k}) - \log(S_t)$ is normally distributed with mean $k\mu$ and variance $k\sigma_k^2$. As a result, we can write S_{t+k} as

$$S_{t+k} = S_t e^{\mu k + \sigma_k \sqrt{k} w}, \tag{4}$$

where w is a standard normal random variable. Then, we can compute the expected price of the derivative at time $t+k$ as

$$\begin{aligned} E_t[H_{t+k}] &= \int_{-\infty}^{\infty} H_{t+k}\left(S_t e^{\mu k + \sigma_k\sqrt{k}w}, \sigma\right) \phi(w)\mathrm{d}w \\ &= \int_{-\infty}^{\infty} \left[e^{-r(\tau-k)} \int_{-\infty}^{\infty} h\left(S_t e^{\mu k + \sigma_k\sqrt{k}w} e^{(r-\frac{\sigma^2}{2})(\tau-k) + \sigma\sqrt{\tau-k}v}\right) \phi(v)\mathrm{d}v\right] \phi(w)\mathrm{d}w \\ &= e^{-r(\tau-k)} \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} h\left(S_t e^{\mu k + (r-\frac{\sigma^2}{2})(\tau-k)} e^{\sqrt{\sigma_k^2 k + \sigma^2(\tau-k)}u}\right) \phi_2\left(u, w; \frac{\sigma_k\sqrt{k}}{\sigma^*\sqrt{\tau}}\right)\mathrm{d}w\mathrm{d}u \end{aligned}$$

$$
\begin{aligned}
&= e^{-r(\tau-k)} \int_{-\infty}^{\infty} h\left(S_t e^{\mu k+\left(r-\frac{\sigma^2}{2}\right)(\tau-k)+\sigma^*\sqrt{\tau}u}\right)\phi(u)\mathrm{d}u \\
&= e^{rk} H_t\left(S_t e^{\mu k+\left(r-\frac{\sigma^2}{2}\right)(\tau-k)-\left(r-\frac{\sigma^{*2}}{2}\right)\tau}, \sigma^*\right) \\
&= e^{rk} H_t(S_t^*, \sigma^*), \qquad (5)
\end{aligned}
$$

where

$$
S_t^* = S_t e^{\mu k+\left(r-\frac{\sigma^2}{2}\right)(\tau-k)-\left(r-\frac{\sigma^{*2}}{2}\right)\tau} = S_t e^{\left(\mu-r+\frac{\sigma_k^2}{2}\right)k} \qquad (6)
$$

and $\phi_2(\cdot,\cdot;\rho)$ stands for the density function of a standard bivariate normal random variable with correlation ρ. In the above derivation, we make a change of variable of

$$
u = \frac{\sigma_k\sqrt{k}w + \sigma\sqrt{\tau-k}v}{\sqrt{\sigma_k^2 k + \sigma^2(\tau-k)}} = \frac{\sigma_k\sqrt{k}w + \sigma\sqrt{\tau-k}v}{\sigma^*\sqrt{\tau}} \sim N(0,1), \qquad (7)
$$

and we have

$$
\mathrm{Corr}[u,w] = \mathrm{Cov}[u,w] = \frac{\sigma_k\sqrt{k}}{\sigma^*\sqrt{\tau}}. \qquad (8)
$$

This completes the proof.

OA.2 Proof of Corollary 1.1

This is a special case of Proposition 1 with $k=\tau$, thus $\sigma^*=\sigma_\tau$ and $S_t^* = S_t e^{(\mu-r+\frac{\sigma_\tau^2}{2})\tau} = \tilde{S}_t$. This completes the proof.

OA.3 Proof of Proposition 2

From the Black-Scholes formula, it is easy to show that

$$
\frac{\partial C^{BS}(S_t^*, K, r, \tau, \sigma^*)}{\partial S_t^*} = \Phi(d_1^*), \qquad (9)
$$

$$
\frac{\partial P^{BS}(S_t^*, K, r, \tau, \sigma^*)}{\partial S_t^*} = -\Phi(-d_1^*), \qquad (10)
$$

$$
\frac{\partial C^{BS}(S_t^*, K, r, \tau, \sigma^*)}{\partial \sigma^*} = S_t^*\phi(d_1^*)\sqrt{\tau}, \qquad (11)
$$

$$
\frac{\partial P^{BS}(S_t^*, K, r, \tau, \sigma^*)}{\partial \sigma^*} = S_t^*\phi(d_1^*)\sqrt{\tau}, \qquad (12)
$$

where

$$d_1^* = \frac{\log\left(\frac{S_t^*}{K}\right) + \left(r + \frac{\sigma^{*2}}{2}\right)\tau}{\sigma^*\sqrt{\tau}}. \tag{13}$$

It follows that

$$\begin{aligned}
\frac{\partial E_t[C_{t+k}]}{\partial \sigma_k} &= e^{rk}\left[\frac{\partial C^{BS}(S_t^*, K, r, \tau, \sigma^*)}{\partial S_t^*}\frac{\partial S_t^*}{\partial \sigma_k} + \frac{\partial C^{BS}(S_t^*, K, r, \tau, \sigma^*)}{\partial \sigma^*}\frac{\partial \sigma^*}{\partial \sigma_k}\right] \\
&= e^{rk}\left[\Phi(d_1^*)S_t^* k\sigma_k + S_t^*\phi(d_1^*)\sqrt{\tau}\frac{k\sigma_k}{\tau\sigma^*}\right] \\
&= e^{rk}S_t^* k\sigma_k\left[\Phi(d_1^*) + \frac{\phi(d_1^*)}{\sigma^*\sqrt{\tau}}\right], \qquad (14) \\
\frac{\partial E_t[P_{t+k}]}{\partial \sigma_k} &= e^{rk}\left[\frac{\partial P^{BS}(S_t^*, K, r, \tau, \sigma^*)}{\partial S_t^*}\frac{\partial S_t^*}{\partial \sigma_k} + \frac{\partial P^{BS}(S_t^*, K, r, \tau, \sigma^*)}{\partial \sigma^*}\frac{\partial \sigma^*}{\partial \sigma_k}\right] \\
&= e^{rk}\left[-\Phi(-d_1^*)S_t^* k\sigma_k + S_t^*\phi(d_1^*)\sqrt{\tau}\frac{k\sigma_k}{\tau\sigma^*}\right] \\
&= e^{rk}S_t^* k\sigma_k\left[-\Phi(-d_1^*) + \frac{\phi(d_1^*)}{\sigma^*\sqrt{\tau}}\right]. \qquad (15)
\end{aligned}$$

We now show that when $k = \tau$ and $\mu > 0$, $\partial E_t[P_{t+k}]/\partial\sigma_k > 0$ for at-the-money and out-of-the-money put options. Note that when $k = \tau$ and $\mu > 0$,

$$S_t \geq K \Rightarrow S_t^* \geq Ke^{\left(\mu - r + \frac{\sigma_\tau^2}{2}\right)\tau} \Rightarrow d_1^* \geq \sigma^*\sqrt{\tau}. \tag{16}$$

It follows that

$$-\Phi(-d_1^*) + \frac{\phi(d_1^*)}{\sigma^*\sqrt{\tau}} \geq -\Phi(-d_1^*) + \frac{\phi(d_1^*)}{d_1^*} = \frac{\Phi(-d_1^*)}{d_1^*}\left[-d_1^* + \frac{\phi(d_1^*)}{\Phi(-d_1^*)}\right] > 0. \tag{17}$$

The last inequality follows from the result of Gordon (1941) regarding inverse Mill's ratio for normal random variable that states for $d_1^* \geq 0$,

$$\frac{\phi(d_1^*)}{1 - \Phi(d_1^*)} > d_1^*. \tag{18}$$

This completes the proof.

OA.4 Proof of Monotonicity of σ_k^2 in γ

We show that under the bivariate O-U process, σ_k^2 is a monotonically decreasing function of γ. The expression of σ_k^2 is given by

$$\sigma_k^2 = \frac{1}{k\gamma}\left[\sigma^2 + \frac{\lambda^2\sigma_x^2}{\delta(\gamma+\delta)}\right]\left[(1-e^{-k\gamma}) - \frac{\lambda}{\gamma-\delta}\beta_{qx}(e^{-k\delta} - e^{-k\gamma})\right], \tag{19}$$

where

$$\beta_{qx} = \frac{\gamma\lambda\sigma_x^2}{\delta(\delta+\gamma)\sigma^2 + \lambda^2\sigma_x^2}. \tag{20}$$

Taking derivative of σ_k^2 with respect to γ, we obtain

$$\frac{\partial\sigma_k^2}{\partial\gamma} = \frac{e^{-k(\delta+\gamma)}}{\delta\gamma^2(\delta^2-\gamma^2)^2 k}[f_1 + \lambda^2\sigma_x^2 f_2], \tag{21}$$

where

$$f_1 = -\delta e^{k\delta}(\delta^2-\gamma^2)^2(e^{k\gamma} - 1 - k\gamma)\sigma^2, \tag{22}$$

$$f_2 = 2\gamma^3 e^{k\gamma} - (\delta-\gamma)^2(\delta+2\gamma)e^{k(\delta+\gamma)} + [\delta^2(1+k\gamma) - \gamma^2(3+k\gamma)]\delta e^{k\delta}. \tag{23}$$

Since $e^{k\gamma} > 1 + k\gamma$, it is obvious that $f_1 \leq 0$. It suffices to show that $f_2 \leq 0$. Let $a = k\gamma$ and $b = k\delta$. We can re-write f_2 as a function of a and b as follows

$$\begin{aligned} f_2/k^3 = f(a,b) &= 2a^3e^a - (a-b)^2(b+2a)e^{a+b} + (b^2(1+a) - a^2(3+a))be^b \\ &= 2a^3e^a + b[(1+a)b^2 - (3+a)a^2]e^b - (a-b)^2(2a+b)e^{a+b}. \end{aligned} \tag{24}$$

We first show that $f(a, a+d) \leq f(a,a) = 0$ for $d > 0$. We have

$$f(a,a+d) = e^a\left\{2a^3 + (a+d)[2a^2(d-1) + d^2 + ad(2+d)]e^d - d^2(3a+d)e^{a+d}\right\}. \tag{25}$$

Since $e^a > 0$, it suffices to show that the expression within the braces is non-positive. This follows because

$$\begin{aligned} &2a^3 + (a+d)[2a^2(d-1) + d^2 + ad(2+d)]e^d - d^2(3a+d)e^{a+d} \\ &\leq 2a^3 + (a+d)[2a^2(d-1) + d^2 + ad(2+d)]e^d - d^2(3a+d)e^d\left(1 + a + \frac{a^2}{2}\right) \\ &= -\frac{a^2}{2}[d^3e^d + (-4 + 4e^d - 4de^d + 3d^2e^d)a] \end{aligned}$$

$$= -\frac{a^2}{2}\left(d^3 e^d + a\sum_{n=2}^{\infty}\frac{3n^2-7n+4}{n!}d^n\right) \leq 0. \tag{26}$$

We next show that $f(b+c,b) \leq f(b,b) = 0$ for $c > 0$. We have

$$f(b+c,b) = e^b\left\{b^3(1+b+c) - b(b+c)^2(3+b+c) + 2(b+c)^3e^c - c^2(3b+2c)e^{b+c}\right\}. \tag{27}$$

Since $e^b > 0$, it suffices to show that the expression within the braces is non-positive. This follows because

$$\begin{aligned}
&b^3(1+b+c) - b(b+c)^2(3+b+c) + 2(b+c)^3e^c - c^2(3b+2c)e^{b+c} \\
\leq\, &b^3(1+b+c) - b(b+c)^2(3+b+c) + 2(b+c)^3e^c - c^2(3b+2c)e^c\left(1+b+\frac{b^2}{2}\right) \\
\equiv &-\frac{b}{2}(d_0 + d_1 b + d_2 b^2).
\end{aligned} \tag{28}$$

Hence, it suffices to show that d_0, d_1, and d_2 are all non-negative. Using power series expansion around 0, we observe that

$$\begin{aligned}
d_0 &= 2c^2[3+c+(2c-3)e^c] = 2c^2\sum_{n=2}^{\infty}\frac{2n-3}{n!}c^n \geq 0, \\
d_1 &= 6c(2+c) + 2c[c(3+c)-6]e^c = 2c\sum_{n=2}^{\infty}\frac{n^2+2n-6}{n!}c^n \geq 0, \\
d_2 &= 4(1+c) + (3c^2-4)e^c = \sum_{n=2}^{\infty}\frac{3n^2-3n-4}{n!}c^n \geq 0.
\end{aligned} \tag{29}$$

This completes the proof.

OA.5 Proof of Monotonicity of $\rho_k(1)$ in γ

We show that under the bivariate O-U process, $\rho_k(1)$ is a monotonically decreasing function of γ. Given the expression of $\rho_k(1)$, it can be shown that

$$\frac{\partial \rho_k(1)}{\partial \gamma} = \frac{\sigma^4 f_1 + \sigma^2\lambda^2\sigma_x^2 f_2 + \lambda^4\sigma_x^4 f_3}{c}, \tag{30}$$

where

$$c = 2e^{k\gamma}\left[e^{k\gamma}(e^{k\delta}-1)\gamma\lambda^2\sigma_x^2 + \delta e^{k\delta}(e^{k\gamma}-1)(\gamma^2\sigma^2-\lambda^2\sigma_x^2) - \delta^3 e^{k\delta}(e^{k\gamma}-1)\sigma^2\right]^2 > 0 \tag{31}$$

and

$$f_1 = -\delta^2 e^{2k\delta}(e^{k\gamma}-1)^2(\delta^2-\gamma^2)^2 k, \tag{32}$$

$$\begin{aligned} f_2 = {} & \delta(\delta^2+\gamma^2)e^{k\gamma}(e^{k\delta}-1)(e^{k\gamma}-1)(e^{k\delta}-e^{k\gamma}) \\ & - \delta(\delta^2-\gamma^2)[2k\delta e^{2k\delta}(e^{k\gamma}-1)^2 - k\gamma(e^{k\delta}-1)e^{k\gamma}(e^{k\delta+k\gamma}+e^{k\gamma}-2e^{k\delta})], \end{aligned} \tag{33}$$

$$\begin{aligned} f_3 = {} & -\delta[e^{k\delta+3k\gamma} - e^{3k\gamma} + k\delta e^{2k\delta}(e^{k\gamma}-1)^2 + (1+k\gamma)e^{2k\gamma} \\ & - (1+k\gamma)e^{2k\delta+2k\gamma} - (1+2k\gamma)(e^{k\delta+k\gamma} - e^{2k\delta+k\gamma})]. \end{aligned} \tag{34}$$

To prove $\partial\rho_k(1)/\partial\gamma \leq 0$, we need to prove that $f_1 \leq 0$, $f_2 \leq 0$, and $f_3 \leq 0$. It is obvious that $f_1 \leq 0$.

Proof of $f_2 \leq 0$:

Let $a = k\gamma$ and $b = k\delta$. Dividing f_2 by δ/k^2, which preserves the sign of f_2, we obtain a function of a and b

$$\begin{aligned} g(a,b) = {} & (a^2+b^2)e^a(e^a-1)(e^b-1)(e^b-e^a) \\ & + (a^2-b^2)[2be^{2b}(e^a-1)^2 - ae^a(e^b-1)(e^{a+b}+e^a-2e^b)]. \end{aligned} \tag{35}$$

First, consider the case $\delta > \gamma$ so that $b > a$. We want to show that $g(a, a+d) < g(a,a) = 0$ for $d > 0$, hence g is a decreasing function of b for $b > a$ when fixing a. Taking a partial derivative of $g(a, a+d)$ with respect to d, we get $\partial g(a,a+d)/\partial d = -e^{2a}g_1(a,d)$, where

$$\begin{aligned} g_1(a,d) = {} & -(2a^2+2ad+d^2)e^{a+d}(e^a-1)(e^d-1) - [a^2+(a+d)^2]e^d(e^a-1)(e^{a+d}-1) \\ & - 2(a+d)(e^a-1)(e^d-1)(e^{a+d}-1) \\ & + 2(a+d)[2(a+d)e^{2d}(e^a-1)^2 - a(e^{a+d}-1)(e^{a+d}-2e^d+1)] \\ & + 2d(2a+d)e^d[(1+2d)e^d(e^a-1)^2 + a(e^{2a+d}-2e^{a+d}+2e^d-1)]. \end{aligned} \tag{36}$$

We now show that $g_1(a,d) \geq 0$. Observing that $g_1(0,d) = 0$, it suffices to show that $\frac{\partial g_1}{\partial a} \geq 0$. Repeating similar argument, we have $\frac{\partial g_1}{\partial a}(0,d) = 0$, hence it reduces to showing that $\frac{\partial^2 g_1}{\partial a^2} \geq 0$. We then have

$$\frac{\partial^2 g_1}{\partial a^2}(0,d) = -2d + 8de^d + 4d^2e^d - 6de^{2d} + 6d^2e^{2d} + 8d^3e^{2d}$$

$$= \sum_{n=1}^{\infty} \frac{(n+2)[(2n-3)2^n+4]}{n!} d^{n+1} \geq 0. \tag{37}$$

Therefore, it now suffices to show that $\frac{\partial^3 g_1}{\partial a^3}$ is non-negative. We have the following functional form

$$\frac{\partial^3 g_1}{\partial a^3} = 2e^a d_0(a,d) + 2e^a d_1(a,d)a + 8e^{a+d} d_2(a,d)a^2, \tag{38}$$

where

$$\begin{aligned} d_0(a,d) &= 4\left(4d^3+19d^2+13d-6\right)e^{a+2d} + 4(d+2)(d+3)e^{a+d} \\ &\quad - \left(4d^3+35d^2+47d-3\right)e^{2d} - d - 3, \end{aligned} \tag{39}$$

$$d_1(a,d) = 8\left(5d^2+9d-4\right)e^{a+2d} + 8(d+4)e^{a+d} - \left(10d^2+32d-1\right)e^{2d} - 1, \tag{40}$$

$$d_2(a,d) = (4d-2)e^{a+d} + 2e^a - de^d. \tag{41}$$

We now show that d_0, d_1, and d_2 are all non-negative. Since $d_0(a,0) = 0$, taking a derivative with respect to d we obtain

$$\begin{aligned} \frac{\partial d_0}{\partial d} &= 4\left(d^2+7d+11\right)e^{a+d} + 4\left(8d^3+50d^2+64d+1\right)e^{a+2d} \\ &\quad - \left(8d^3+82d^2+164d+41\right)e^{2d} - 1 \\ &\geq 4\left(d^2+7d+11\right)e^{d} + 4\left(8d^3+50d^2+64d+1\right)e^{2d} - \left(8d^3+82d^2+164d+41\right)e^{2d} - 1 \\ &= 4\left(d^2+7d+11\right)e^{d} + \left(24d^3+118d^2+92d-37\right)e^{2d} - 1 \geq 6, \end{aligned} \tag{42}$$

where the last inequality can be shown by power series expansion in d around 0, which we omit the expression for brevity. Next, since $d_1(a,0) = 0$, taking a derivative with respect to d we obtain

$$\begin{aligned} \frac{\partial d_1}{\partial d} &= 2e^d\left[4\left(10d^2+28d+1\right)e^{a+d} + 4(d+5)e^a - \left(10d^2+42d+15\right)e^d\right] \\ &\geq 2e^d\left[4\left(10d^2+28d+1\right)e^{d} + 4(d+5) - \left(10d^2+42d+15\right)e^d\right] \\ &= 2e^d[4(5+d) + (30d^2+70d-11)e^d] \geq 18e^d, \end{aligned} \tag{43}$$

where the last inequality can be shown by power series expansion in d around 0, which we omit the expression for brevity. Lastly, since $d_2(a,0) = 0$, taking a derivative with respect to d we obtain

$$\frac{\partial d_2}{\partial d} = e^d[2e^a - 1 + (4e^a-1)d] > 0. \tag{44}$$

This completes the proof that $g(a, a+d) < g(a, a) = 0$ for $d > 0$.

Similarly, we now need to show that $g(b+c, b) < g(b, b) = 0$ for $c > 0$. Taking a partial derivative of $g(b+c, b)$ with respect to c, we get $\partial g(b+c, b)/\partial c = -e^{2b} g_2(b, c)$, where

$$\begin{aligned} g_2(b,c) = {} & (2b^2+2bc+c^2)e^c(e^b-1)(3e^{b+2c}-2e^{b+c}-2e^c+1) \\ & + 2(b+c)e^c(e^b-1)(e^c-1)(e^{b+c}-1) \\ & - 2(b+c)[2b(e^{b+c}-1)^2-(b+c)e^c(e^b-1)(e^{b+c}+e^c-2)] \\ & - c(2b+c)e^c\{2b(e^{2b+c}-e^b+e^c-1)-(e^b-1)[(2c+1)(e^{b+c}+e^c-1)-1]\}. \end{aligned} \tag{45}$$

The proof of $g_2(b, c) \geq 0$ is similar to the proof of $g_1(a, d) \geq 0$, so we only sketch it here. Since $g_2(0, c) = 0$, it suffices to show that $\frac{\partial g_2}{\partial b} \geq 0$. We then show that $\frac{\partial g_2}{\partial b}(0, c) \geq 0$, which suggests that it suffices to show that $\frac{\partial^2 g_2}{\partial b^2} \geq 0$. Repeating similar argument, we have $\frac{\partial^2 g_2}{\partial c^2}(0, c) = 0$ and it suffices to show $\frac{\partial^3 g_2}{\partial b^3} \geq 0$. After simplification, we obtain

$$\frac{\partial^3 g_2}{\partial b^3} = e^{b+c}e_0(b,c) + 2e^{b+c}e_1(b,c)b + 2e^{b+c}e_2(b,c)b^2, \tag{46}$$

where

$$\begin{aligned} e_0(b,c) = {} & 2c^3(8e^{b+c}-1) + 6(e^c-1)(16e^{b+c}-7e^c-7) + 4c(e^c-1)(22e^{b+c}-5e^c-5) \\ & + c^2(24e^{b+2c}+32e^{b+c}-3e^{2c}-11), \end{aligned} \tag{47}$$

$$\begin{aligned} e_1(b,c) = {} & c^2(8e^{b+c}-1) + (e^c-1)(80e^{b+c}-19e^c-19) \\ & + c(24e^{b+2c}-56e^{b+c}-3e^{2c}+11), \end{aligned} \tag{48}$$

$$e_2(b,c) = c(2-16e^{b+c}) + 3(e^c-1)(8e^{b+c}-e^c-1). \tag{49}$$

The proof that e_0, e_1, and e_2 are positive is similar to the proof of of positivity of d_0, d_1, and d_2, so we do not repeat it here. This completes the proof that $g(b+c, b) < 0$, hence $g(a, b)$ is negative for all a and b.

Proof of $f_3 \leq 0$:

We now show that $f_3 \leq 0$. Let $a = k\gamma$ and $b = k\delta$, we need to show that

$$f(a,b) = e^{3a+b} - e^{3a} + be^{2b}(e^a-1)^2 - (1+a)e^{2a}(e^{2b}-1) + (1+2a)(e^{a+2b}-e^{a+b}) \geq 0. \tag{50}$$

We first show that $f(a, a+d) \geq f(a, a) = 0$ for $d > 0$. We have $f(a, a+d) = e^{2a}g(a, d)$,

where

$$g(a,d) = a(e^d-1)^2 + (e^a-1)[e^d - 1 - de^{2d} + e^{a+d} + (d-1)e^{a+2d}]. \tag{51}$$

As $g(0,d) = 0$, it suffices to show that $\frac{\partial g}{\partial a} \geq 0$. Using the inequality

$$1 + (d-1)e^d = \sum_{n=2}^{\infty} \frac{n-1}{n!} d^n \geq 0, \tag{52}$$

we obtain

$$\begin{aligned} \frac{\partial g}{\partial a} &= (e^a-1)\{2e^{a+d}[1+(d-1)e^d] - (e^d-1)^2\} \\ &\geq (e^a-1)\{2e^d[1+(d-1)e^d] - (e^d-1)^2\} \\ &= (e^a-1)[-1 + 4e^d + (2d-3)e^{2d}] \\ &= (e^a-1)\sum_{n=2}^{\infty} \frac{4+(n-3)2^n}{n!} d^n \geq 0. \end{aligned} \tag{53}$$

We next show that $f(b+c,b) \geq f(b,b) = 0$ for $c > 0$. We have $f(b+c,b) = e^{2b}h(b,c)$, where

$$h(b,c) = b(e^c-1)^2 + e^c(e^b-1)[(e^c-1)(e^{b+c}-1) - c(-2+e^c+e^{b+c})]. \tag{54}$$

As $h(0,c) = 0$, it suffices to show that $\frac{\partial h}{\partial b} \geq 0$. We have

$$\begin{aligned} \frac{\partial h}{\partial b} &= (e^{b+c}-1)[2e^{b+c}(e^c-1-c) - (e^c-1)^2] \\ &\geq (e^{b+c}-1)[2e^c(e^c-1-c) - (e^c-1)^2] \\ &= (e^{b+c}-1)(e^{2c} - 2ce^c - 1) \\ &= (e^{b+c}-1)\sum_{n=2}^{\infty} \frac{2^n-2n}{n!} c^n \geq 0. \end{aligned} \tag{55}$$

This completes the proof that $f_3 \leq 0$.

OA.6 Delta-hedged Option Return

As in Goyal and Saretto (2009), we consider static delta-hedged call option gain held-to-expiration given by

$$\Pi^C_{t,T} = C_T - \Delta^C_t S_T - (C_t - \Delta^C_t S_t)e^{r\tau}. \tag{56}$$

Hence, the expected Delta-hedged call option gain held-to-expiration can be computed as

$$
\begin{aligned}
E_t[\Pi_{t,T}^C] &= E_t[C_T - \Delta_t^C S_T - (C_t - \Delta_t^C S_t)e^{r\tau}] \\
&= E_t[C_T] - \Delta_t^C E_t[S_T] - (C_t - \Delta_t^C S_t)e^{r\tau} \\
&= E_t[C_T] - \Delta_t^C S_t e^{\tau\mu + \frac{\tau\sigma_\tau^2}{2}} - (C_t - \Delta_t^C S_t)e^{r\tau}. \qquad (57)
\end{aligned}
$$

Now, if we take the partial derivative of the above expected gain with respect to σ_τ, which has equivalent sign as taking partial derivative with respect to the first-order autocorrelation, using (15) we get

$$
\begin{aligned}
\frac{\partial E_t[\Pi_{t,T}^C]}{\partial \sigma_\tau} &= \frac{\partial E_t[C_T]}{\partial \sigma_\tau} - \Delta_t^C S_t e^{\tau\mu + \frac{\tau\sigma_\tau^2}{2}} \tau\sigma_\tau \\
&= e^{r\tau} S_t^* \tau\sigma_\tau \left[(\Phi(d_1^*) - \Phi(d_1)) + \frac{\phi(d_1^*)}{\sigma_\tau\sqrt{\tau}} \right]. \qquad (58)
\end{aligned}
$$

For put option, we have

$$
E_t[\Pi_{t,T}^P] = E_t[P_T] - \Delta_t^P S_t e^{\tau\mu + \frac{\tau\sigma_\tau^2}{2}} - (P_t - \Delta_t^P S_t)e^{r\tau}. \qquad (59)
$$

Using (16), we get

$$
\begin{aligned}
\frac{\partial E_t[\Pi_{t,T}^P]}{\partial \sigma_\tau} &= \frac{\partial E_t[P_T]}{\partial \sigma_\tau} - \Delta_t^P S_t e^{\tau\mu + \frac{\tau\sigma_\tau^2}{2}} \tau\sigma_\tau \\
&= e^{r\tau} S_t^* \tau\sigma_\tau \left[-\Phi(-d_1^*) + \frac{\phi(d_1^*)}{\sigma_\tau\sqrt{\tau}} + \Phi(-d_1) \right] \\
&= e^{r\tau} S_t^* \tau\sigma_\tau \left[(\Phi(d_1^*) - \Phi(d_1)) + \frac{\phi(d_1^*)}{\sigma_\tau\sqrt{\tau}} \right] \\
&= \frac{\partial E_t[\Pi_{t,T}^C]}{\partial \sigma_\tau}. \qquad (60)
\end{aligned}
$$

The last equality also follows from the put-call parity. Since $\Phi(-d_1)$ is always positive, if $\partial E_t[P_T]/\partial \sigma_\tau$ was positive, then the delta-hedged put option gain has also positive partial derivative with respect to the first-order autocorrelation. Hence, we conclude that delta-hedged option gain also follows the same pattern as the raw return in our case.

OA.7 Expected Option Return under the Stochastic Volatility Model

In this section, we provide analytical expressions for computing expected option returns under the stochastic volatility model discussed in Section 4.3. Expected held-to-expiration call option return is defined by

$$\frac{E_t[\max(S_T - K, 0)]}{E_t^{\mathbb{Q}}[\max(S_T - K, 0)]} - 1. \tag{61}$$

Since the model is cast in affine form, we can apply the standard result to obtain conditional characteristic function of log terminal stock price. The characteristic function of the log-spot price under the physical measure is then given by

$$\begin{aligned} E_t[\exp(iu\log(S_{t+\tau}))])] &= f(u, \tau, \log(S_t), V_t, X_t) \\ &= \exp(A(u,\tau) + B_0(u,\tau)\log(S_t) + B_1(u,\tau)V_t + B_2(u,\tau)X_t), \end{aligned} \tag{62}$$

where A, B_1, and B_2 are given as the solution to the following Ricatti ODE with the initial conditions $A(0) = B_1(0) = B_2(0) = 0$,

$$\begin{aligned} \frac{dA}{d\tau} &= (\mu + \gamma\mu(T-\tau))iue^{-\gamma(T-\tau)} + \kappa\theta B_1 + \frac{1}{2}\sigma_x^2 B_2, \\ \frac{dB_1}{d\tau} &= -\frac{1}{2}u^2 e^{-2\gamma(T-\tau)} + (\xi\rho iue^{-\gamma(T-\tau)} - \kappa)B_1 + \frac{1}{2}\xi^2 B_1^2, \\ \frac{dB_2}{d\tau} &= \lambda iue^{-\gamma(T-\tau)} - \delta B_2, \end{aligned} \tag{63}$$

and $B_0(u,\tau) = iue^{-\gamma(T-\tau)}$. The above system of Ricatti equations can be solved numerically using standard techniques such as the fourth-order Runge-Kutta method. Once the characteristic function is available in a closed-form, expected call option payoff can be valued using the formula following Heston (1993)

$$C_t = S_t P_1 - Ke^{-r\tau}P_2, \tag{64}$$

where the P_1 and P_2 probabilities are computed using Fourier inversion

$$P_1 = \frac{1}{2} + \frac{1}{\pi}\int_0^\infty Re\left[\frac{e^{iu\log\left(\frac{S_t}{K}\right)} f(u+1, \tau, \log(S_t), V_t, X_t)}{iuS_t e^{r\tau}}\right] du,$$

$$P_2 = \frac{1}{2} + \frac{1}{\pi}\int_0^\infty Re\left[\frac{e^{iu\log\left(\frac{S_t}{K}\right)}f(u,\tau,\log(S_t),V_t,X_t)}{iu}\right]du. \tag{65}$$

The integrands in the above expressions vanish quickly and can be computed effectively using a numerical integration scheme such as quadrature.

On the other hand, the model is identical to the Heston (1993)'s stochastic volatility model under the risk-neutral measure. Therefore, the denominator term, which is simply the option price, can be computed following Heston (1993). Since we know the functional form of the conditional characteristic function, a similar method can be applied to compute expected put option return as well.

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Table OA.1
Description of Control Variables in the Fama-MacBeth Regression

Variable	**Description**
skew	*skew* is the physical skewness calculated using the past 22-day daily returns for each stock.
ex-ante_skew	*ex-ante_skew* is the risk-neutral skewness calculated based on Boyer and Vorkink (2014).
bm_ratio	*bm_ratio* for June of year $t-1$ to May of year t is computed as the ratio of the book value of common equity in fiscal year $t-1$ to the market value of equity (size) in December of year $t-1$. Book equity is the book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock.
size	*size* is the natural logarithm of a firm's market cap at the end of each month, and market cap is defined as the product of the closing price and the number of shares outstanding (in millions of dollars).
beta	*beta* is the beta coefficient of each underlying stock based on the CAPM.
disp	*disp* is the standard deviation of the analyst forecasts scaled by the mean of analyst forecasts in Diether, Mallowy, and Scherbina (2002) from the IBES.
baspread	*baspread* is the ratio of the difference between the bid and ask quotes of option to the midpoint of the bid and ask quotes at the end of the previous month.
suv	*suv* is defined as the standardized unexpected volume following Garfinkel and Sokobin (2006). It is computed as the standardized prediction error from a regression of trading volume on the absolute value of returns during the week before the end of each month (trading days $[-6,-2]$ relative to the end of each month).
cfv	*cfv* is the cash flow variance, defined as the variance of the monthly ratio of cash flow to the market value of equity over the last 60 months. Cash flow is calculated as net income plus depreciation and amortization, all scaled by the market value of equity.
ch	*ch* is the cash-to-assets ratio, defined as the value of corporate cash holdings over the value of the firm's total assets.
issue_1y	*issue_1y* is the one-year new issues, measured as the log change in shares outstanding from the past 11 months.
pm	*pm* is the profit margin, defined as earnings before interest and tax scaled by revenues.
lnprice	*lnprice* is the natural logarithm of the price at the end of each month.
profit	*profit* is calculated as earnings divided by book equity, in which earnings is defined as income before extraordinary items.
tef	*tef* is the total external financing, defined as net share issuance plus net debt issuance minus cash dividends, scaled by total assets.
z_score	*z_score* is calculated as (1.2×(working capital/assets) + 1.4×(retained earnings/assets) + 3.3×(EBIT/assets) + 0.6×(market value of equity/book value of total liabilities) + (revenues/assets)).

This table lists predictors used as control variables in Table 4 of the Fama-MacBeth regression.

Table OA.2
Portfolio Sorted by Stock Return Autocorrelation

Panel A. Equal-weighted Portfolio						
	Call Option	Put Option	Delta-hedged Call	Delta-hedged Put	Straddle	Underlying Stock
Low	0.050	−0.143	−0.0055	−0.0068	−0.041	0.0107
2	0.076	−0.129	−0.0036	−0.0048	−0.023	0.0114
3	0.090	−0.124	−0.0034	−0.0047	−0.015	0.0117
4	0.084	−0.097	−0.0021	−0.0042	−0.011	0.0113
High	0.088	−0.079	−0.0017	−0.0040	0.002	0.0105
High-Low	0.037	0.064	0.0038	0.0028	0.043	−0.0002
t-stat	(2.60)	(4.61)	(4.07)	(3.46)	(5.72)	(−0.10)
Two Option-factor alpha	0.043	0.058	0.0050	0.0038	0.043	−0.0011
t-stat	(2.90)	(4.12)	(6.04)	(5.05)	(5.58)	(−0.57)

Panel B: Security Price-weighted Portfolio						
	Call Option	Put Option	Delta-hedged Call	Delta-hedged Put	Straddle	Underlying Stock
Low	0.040	−0.133	−0.0041	−0.0056	−0.045	0.0098
2	0.070	−0.135	−0.0024	−0.0045	−0.028	0.0116
3	0.090	−0.132	−0.0020	−0.0037	−0.017	0.0123
4	0.082	−0.116	−0.0018	−0.0039	−0.018	0.0125
High	0.076	−0.083	−0.0007	−0.0028	−0.001	0.0118
High-Low	0.036	0.051	0.0034	0.0028	0.043	0.0020
t-stat	(2.35)	(3.31)	(4.11)	(3.54)	(4.96)	(1.16)
Two Option-factor alpha	0.043	0.046	0.0044	0.0036	0.045	0.0013
t-stat	(2.78)	(2.92)	(5.74)	(4.86)	(5.05)	(0.74)

This table summarizes the average returns in monthly frequencies for portfolios sorted by the stock return autocorrelation and hold for one month. Panel A reports the equal-weighted average returns, while Panel B reports the security price-weighted average returns assuming we invest equal shares for all firms in the portfolio. In Panel B, for call option, put option, and stock portfolios, the weights are based on the corresponding security prices. For delta-hedged call, delta-hedged put, and straddle, the weights are based on the initial investment for each firm in the portfolio. We follow Zhan, Han, Cao, and Tong (2022) to construct a two option-factor model: illiquidity and idiosyncratic volatility. The factor realizations in each month are obtained as the high-minus-low spread returns of stock value-weighted portfolios of writing delta-neutral calls sorted on the idiosyncratic volatility or the Amihud illiquidity measure of the underlying stock. The alpha is calculated based on the two option-factor model. The sample period is from January 1996 to December 2020.

Table OA.3
Option Portfolios Double Sorted by Stock Return Autocorrelation and Other Stock Characteristics

Panel A: Double Sorting Call Option Return					
Sorted by Realized Volatility	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.061	0.086	0.060	0.035	0.031
t-stat of α	(2.60)	(3.66)	(2.75)	(1.50)	(1.18)
Sorted by Idiosyncratic Volatility	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.071	0.071	0.070	0.041	0.002
t-stat of α	(2.88)	(3.13)	(3.14)	(1.75)	(0.06)
Sorted by Variance Risk Premium	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.038	0.032	0.062	0.037	0.064
t-stat of α	(1.63)	(1.40)	(2.65)	(1.55)	(2.85)
Sorted by ILIQ	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.051	0.034	0.033	0.023	0.053
t-stat of α	(2.23)	(1.45)	(1.39)	(1.02)	(1.95)
Sorted by IVTS	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.012	0.053	0.040	0.074	0.025
t-stat of α	(0.54)	(2.31)	(1.70)	(3.37)	(1.05)
Panel B: Double Sorting Put Option Return					
Sorted by Realized Volatility	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.012	0.054	0.064	0.094	0.022
t-stat of α	(0.45)	(2.53)	(3.27)	(4.12)	(0.93)
Sorted by Idiosyncratic Volatility	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.028	0.040	0.086	0.029	0.062
t-stat of α	(1.01)	(1.92)	(4.12)	(1.24)	(2.76)
Sorted by Variance Risk Premium	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.089	0.048	0.065	0.051	0.059
t-stat of α	(4.19)	(1.96)	(3.00)	(2.26)	(2.73)
Sorted by ILIQ	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.055	0.075	0.058	0.039	0.073
t-stat of α	(2.46)	(3.24)	(2.51)	(1.98)	(3.01)
Sorted by IVTS	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.087	0.058	0.049	0.049	0.061
t-stat of α	(4.52)	(2.62)	(2.11)	(2.40)	(2.71)

In this table, we conduct an unconditional sorting based on a certain stock characteristic and stock return autocorrelation, in total twenty-five bins in two dimensions. We classify a certain security into each bin based on the cutoffs of the sorted characteristic and stock return autocorrelation. ILIQ stands for the stock illiquidity computed following Amihud (2002) and IVTS denotes the implied volatility term structure defined in Section 3. Within each bin we compute the difference of average returns between the high and low stock return autocorrelation quintile. We follow Zhan et al. (2022) to construct a two option-factor model: illiquidity and idiosyncratic volatility. The factor realizations in each month are obtained as the high-minus-low spread returns of stock-value-weighted portfolios of writing delta-neutral calls sorted on the idiosyncratic volatility or the Amihud illiquidity measure of the underlying stock. We report the alpha and the corresponding t-stat based on the two option-factor model for equal-weighted call and put option portfolios.

Table OA.4
Option Portfolios Double Sorted by Stock Return Autocorrelation and Other Stock Characteristics

Panel A: Double Sorting Delta-hedged Call Option Return					
Sorted by Realized Volatility	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.002	0.005	0.005	0.007	0.008
t-stat	(2.89)	(5.06)	(4.54)	(3.91)	(3.36)
Sorted by Idiosyncratic Volatility	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.004	0.005	0.006	0.006	0.006
t-stat	(3.93)	(4.90)	(4.83)	(3.82)	(2.67)
Sorted by Variance Risk Premium	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.006	0.003	0.004	0.005	0.004
t-stat	(3.94)	(2.56)	(3.71)	(3.76)	(2.49)
Sorted by ILIQ	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.003	0.004	0.003	0.004	0.006
t-stat	(2.85)	(2.96)	(2.22)	(2.93)	(2.97)
Sorted by IVTS	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.004	0.005	0.003	0.005	0.005
t-stat	(2.22)	(3.58)	(2.72)	(4.43)	(3.36)

Panel B: Double Sorting Delta-hedged Put Option Return					
Sorted by Realized Volatility	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.002	0.004	0.005	0.007	0.003
t-stat	(2.16)	(3.99)	(4.20)	(4.43)	(1.56)
Sorted by Idiosyncratic Volatility	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.003	0.004	0.005	0.005	0.002
t-stat	(2.83)	(4.59)	(4.62)	(3.19)	(1.22)
Sorted by Variance Risk Premium	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.004	0.002	0.004	0.004	0.004
t-stat	(2.98)	(1.46)	(3.09)	(3.23)	(2.52)
Sorted by ILIQ	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.003	0.003	0.003	0.002	0.004
t-stat	(2.94)	(2.46)	(2.33)	(1.59)	(2.03)
Sorted by IVTS	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.003	0.004	0.003	0.004	0.003
t-stat	(2.12)	(2.87)	(2.18)	(3.90)	(2.08)

In this table, we conduct an unconditional sorting based on a certain stock characteristic and stock return autocorrelation, in total twenty-five bins in two dimensions. We classify a certain security into each bin based on the cutoffs of the sorted characteristic and stock return autocorrelation. ILIQ stands for the stock illiquidity computed following Amihud (2002) and IVTS denotes the implied volatility term structure defined in Section 3. Within each bin we compute the difference of average returns between the high and low stock return autocorrelation quintile. We show the results for equal-weighted delta-hedged call and delta-hedged put portfolios.

Table OA.5
Option Portfolios Double Sorted by Stock Return Autocorrelation and Other Stock Characteristics

Panel A: Double Sorting Straddle Return					
Sorted by Realized Volatility	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.049	0.058	0.042	0.055	0.026
t-stat	(3.51)	(4.40)	(3.31)	(4.16)	(1.66)
Sorted by Idiosyncratic Volatility	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.056	0.048	0.057	0.038	0.025
t-stat	(3.81)	(3.85)	(4.79)	(2.83)	(1.66)
Sorted by Variance Risk Premium	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.049	0.033	0.055	0.052	0.050
t-stat	(3.88)	(2.66)	(4.49)	(3.74)	(3.78)
Sorted by ILIQ	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.049	0.049	0.042	0.037	0.022
t-stat	(4.40)	(3.78)	(3.37)	(2.71)	(1.15)
Sorted by IVTS	**Low**	**2**	**3**	**4**	**High**
High ρ − Low ρ	0.041	0.053	0.040	0.052	0.040
t-stat	(3.00)	(4.28)	(2.93)	(4.21)	(3.09)
Panel B: Double Sorting Straddle Return (Alpha)					
Sorted by Realized Volatility	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.045	0.056	0.041	0.053	0.022
t-stat of α	(3.15)	(4.21)	(3.15)	(3.91)	(1.37)
Sorted by Idiosyncratic Volatility	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.058	0.042	0.057	0.035	0.024
t-stat of α	(3.81)	(3.30)	(4.65)	(2.53)	(1.53)
Sorted by Variance Risk Premium	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.049	0.032	0.061	0.048	0.046
t-stat of α	(3.84)	(2.48)	(4.87)	(3.38)	(3.41)
Sorted by ILIQ	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.049	0.050	0.038	0.032	0.010
t-stat of α	(4.40)	(3.83)	(2.99)	(2.30)	(0.50)
Sorted by IVTS	**Low**	**2**	**3**	**4**	**High**
α of High ρ − Low ρ	0.040	0.049	0.039	0.054	0.042
t-stat of α	(2.83)	(3.88)	(2.77)	(4.22)	(3.20)

In this table, we conduct an unconditional sorting based on a certain stock characteristic and stock return autocorrelation, in total twenty-five bins in two dimensions. We classify a certain security into each bin based on the cutoffs of the sorted characteristic and stock return autocorrelation. ILIQ stands for the stock illiquidity computed following Amihud (2002) and IVTS denotes the implied volatility term structure defined in Section 3. Within each bin we compute the difference of average returns between the high and low stock return autocorrelation quintile. In Panel A, we show the results for equal-weighted straddle portfolios. In Panel B, we follow Zhan et al. (2022) to construct a two option-factor model: illiquidity and idiosyncratic volatility. The factor realizations in each month are obtained as the high-minus-low spread returns of stock-value-weighted portfolios of writing delta-neutral calls sorted on the idiosyncratic volatility or the Amihud illiquidity measure of the underlying stock. We report the alpha and the corresponding t-stat based on the two option-factor model for straddle portfolios.

Table OA.6
Fama-MacBeth Regressions with Stock Return Autocorrelation

	Call Option	Put Option	Delta-hedged Call	Delta-hedged Put	Straddle	Underlying Stock
Intercept	7.761	−11.415	−0.326	−0.490	−1.766	1.113
t-stat	(2.42)	(−2.28)	(−1.70)	(−2.74)	(−0.98)	(2.74)
Autocorrelation	1.200	2.284	0.125	0.083	1.363	−0.009
t-stat	(2.48)	(4.87)	(3.86)	(2.97)	(5.67)	(−0.12)
Average adj. R^2 (%)	0.29	0.32	0.25	0.26	0.28	0.54

This table reports the Fama-MacBeth regressions for each dependent variable that is the return of different securities specified at the top of each column. The independent variable is stock return autocorrelation. All predictors are normalized to have mean zero and standard deviation of one at each month. The detailed cross-sectional regression and time-series test are specified in Section 3.3. All dependent and independent variables are expressed as monthly values and the coefficients are multiplied by 100. The coefficients in the table are calculated by taking the time-series average of the cross-sectional regressions over time. The t-stat reported is the t-test with Newey-West one-lag correction. The sample period is from January 1996 to December 2020.

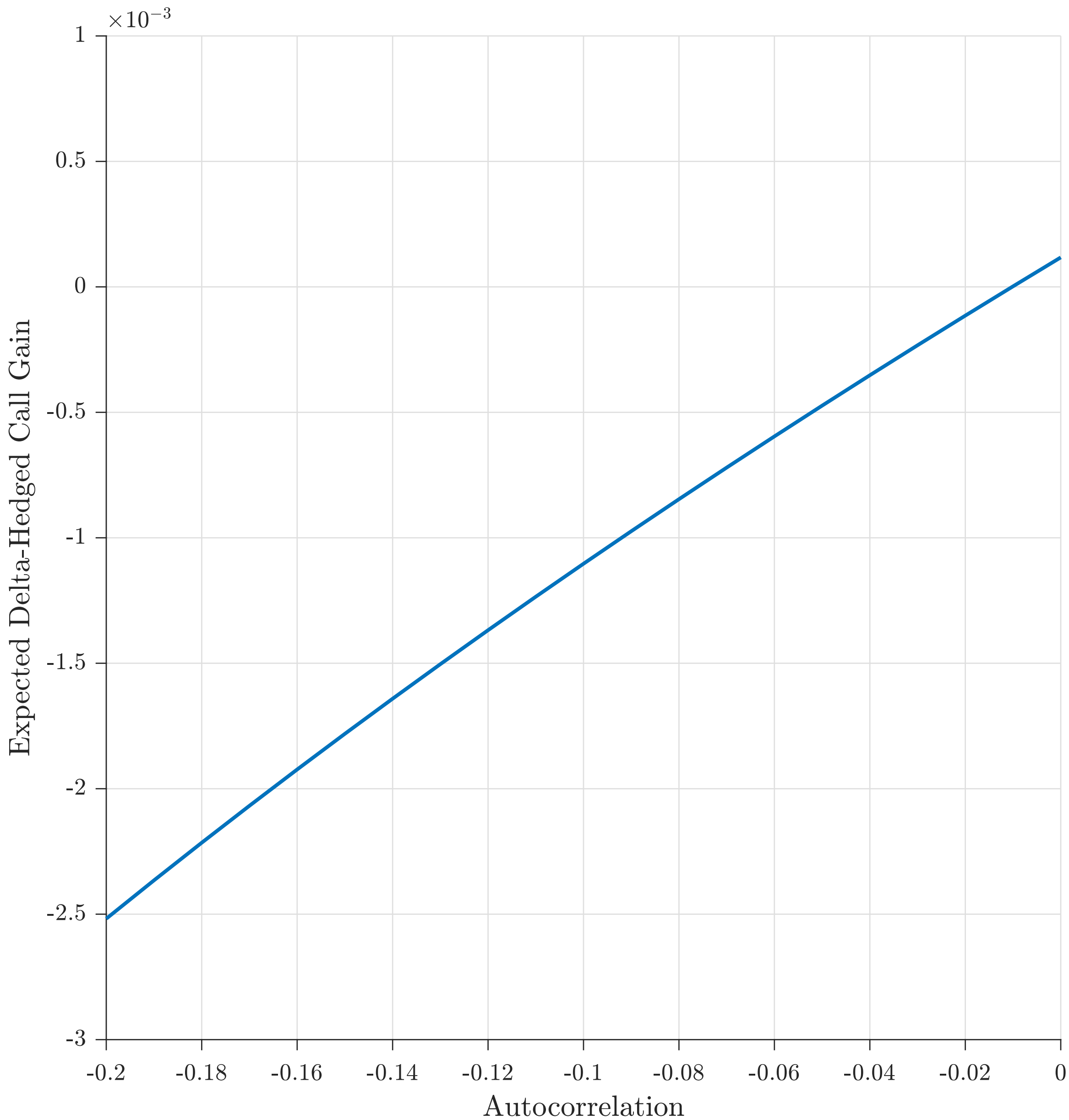

Figure OA.1
Expected Delta-hedged Call Option Gain under the Trending O-U Process
This figure plots the expected hold-to-expiration call option gain as a function of first-order autocorrelation of stock returns under the trending O-U process. All options are at-the-money options with the following parameters: $\mu = 0.10$, $r = 0.05$, $\tau = 1/12$, and $\sigma = 0.2$.